



DPC: 20/30411027 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 07 February 2020

Origin: European

Latest date for receipt of comments: 04 March 2020

Project No. 2020/00221

Responsible committee: PEL/69 Electric vehicles

Interested committees:

Title: Draft BS EN IEC 62840-1 Electric vehicle battery swap system. Part 1: General and guidance.

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 04 March 2020

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



69/715/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 62840-1 ED1

DATE OF CIRCULATION:

2020-02-07

CLOSING DATE FOR COMMENTS:

2020-04-03

SUPERSEDES DOCUMENTS:

69/707/RR

IEC TC 69 : ELECTRICAL POWER/ENERGY TRANSFER SYSTEMS FOR ELECTRICALLY PROPELLED ROAD VEHICLES AND INDUSTRIAL TRUCKS

SECRETARIAT:

Belgium

SECRETARY:

Mr Peter Van den Bossche

OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 23H, TC 64

PROPOSED HORIZONTAL STANDARD:

☐

Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☒ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Electric vehicle battery swap system - Part 1: General and guidance

NOTE FROM TC/SC OFFICERS:

CONTENTS

1		
2	FOREWORD	4
3	INTRODUCTION	6
4	1 Scope	7
5	2 Normative references	7
6	3 Terms and definitions	7
7	4 System overview	9
8	4.1 Battery swap system	9
9	4.2 Battery swap station	11
10	4.2.1 General description	11
11	4.2.2 Lane system	11
12	4.2.3 Battery handling system	12
13	4.2.4 Storage system	12
14	4.2.5 Charging system	12
15	4.2.6 Supervisory and control system	12
16	4.3 Supporting systems (optional)	13
17	4.3.1 General supporting systems	13
18	4.3.2 SBS logistic system	13
19	4.3.3 Battery maintenance system	13
20	4.4 Swappable battery system	13
21	4.5 Power supply system	13
22	4.6 Interfaces	13
23	4.7 Zones	14
24	4.7.1 General	14
25	4.7.2 Vehicle lane zone	14
26	4.7.3 Battery swap zone	14
27	4.7.4 Battery storage zone	15
28	4.7.5 Battery charging zone	15
29	5 Classification	16
30	5.1 General	16
31	5.2 Automation level	16
32	5.2.1 General	16
33	5.2.2 Full automatic	16
34	5.2.3 Semi-automatic	17
35	5.2.4 Manual mode	17
36	5.3 SBS swapping direction	17
37	5.4 EV categories	17
38	5.5 Environmental conditions	17
39	Annex A (informative) Use case	18
40	A.1 Use case for positioning vehicle	18
41	A.2 Use case for swapping battery pack	18
42	A.3 Use case for charging SBS	19
43	A.4 Use case for maintaining SBS	19
44	A.5 Use case for emergency charging vehicle	19
45	Annex B (informative) Battery swap station solutions	21
46	B.1 General	21

47	B.2	Commercial vehicles battery swap station	23
48	B.2.1	Automatic side-swapping station	23
49	B.2.2	Automatic top-swapping station	23
50	B.3	Passenger cars battery swap station	24
51	B.3.1	Semi-automatic rear-swapping station	24
52	B.3.2	Automatic bottom-swapping station	25
53	B.3.3	Automatic side-swapping station	26
54	Bibliography		28
55			
56	Figure 1 – EV battery swap system		10
57	Figure B.1 – Automatic side-swapping station layout		23
58	Figure B.2 – Automatic top-swapping station layout		24
59	Figure B.3 – Semi-automatic rear-swapping station layout		25
60	Figure B.4 – Automatic bottom-swapping station layout		26
61	Figure B.5 – Automatic side-swapping station layout		27
62			
63	Table 1 – Accessibility of vehicle lane zone		14
64	Table 2 – Accessibility of battery swap zone		15
65	Table 3 – Accessibility of battery storage zone		15
66	Table 4 – Accessibility of battery charging zone		16
67	Table A.1 – Use case for positioning vehicle		18
68	Table A.2 – Use case for swapping battery pack		18
69	Table A.3 – Use case for charging SBS		19
70	Table A.4 – Use case for maintaining SBS		19
71	Table A.5 – Use case for emergency charging vehicle		20
72	Table B.1 – Key index of the systems in different types of battery swap stations		22
73			
74			

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC VEHICLE BATTERY SWAP SYSTEM –

Part 1: General and guidance

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a Technical Specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62840-1, which is an International Standard, has been prepared by IEC technical committee 69: Electric road vehicles and electric industrial trucks.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2

129 A list of all parts in the IEC 62840 series, published under the general title *Electric vehicle*
130 *battery swap system*, can be found on the IEC website.

131 The committee has decided that the contents of this publication will remain unchanged until
132 the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data
133 related to the specific publication. At this date, the publication will be

- 134 • transformed into an International standard,
- 135 • reconfirmed,
- 136 • withdrawn,
- 137 • replaced by a revised edition, or
- 138 • amended.

139 A bilingual version of this publication may be issued at a later date.

140

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

141

142

143

INTRODUCTION

144 The purpose of the battery swap system is to provide energy partly or in total to electric road
145 vehicles (EVs) through fast replacement of their swappable battery system (SBS). While
146 charging, the EV typically takes a relatively long time, the battery swap process takes only a
147 few minutes to complete. Thus, it will reduce range anxiety and will facilitate travel for longer
148 distances.

149 As there is a possibility to charge the batteries after their removal from the vehicle in various
150 ways, the impact of this process on the critical infrastructure of the electrical grid is minimized.

151 Battery swap stations mainly include one or more of the following functions:

- 152 • swap of EV swappable battery system (SBS);
- 153 • storage of EV SBS;
- 154 • charging and cooling of EV SBS;
- 155 • testing, maintenance and safety management of EV SBS.

156 This document serves as generic requirements for battery swap systems for EVs.

157 The IEC 62840 series includes two parts:

- 158 – IEC 62840-1: General and guidance;
- 159 – IEC 62840-2: Safety requirements.

160

ELECTRIC VEHICLE BATTERY SWAP SYSTEM –

Part 1: General and guidance

1 Scope

This part of IEC 62840, which is an International Standards, gives the general overview for battery swap systems, for the purposes of swapping batteries of electric road vehicles (EVs) when the vehicle powertrain is turned off and when the battery swap system is connected to the supply network at standard supply voltages according to IEC 60038 with a rated voltage up to 1 000 V AC and up to 1 500 V DC.

This document is applicable for battery swap systems for EV equipped with one or more swappable battery system (SBS).

NOTE Battery swap systems for light electric vehicles (LEVs) where protection against electric shock relies on double or reinforced insulation according to the IEC 61851-3¹ series are under consideration.

This document is not applicable to:

- aspects related to maintenance and service of the battery swap station (BSS);
- trolley buses, rail vehicles and vehicles designed primarily for use off-road;
- maintenance and service of EVs.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60038, *IEC standard voltages*

3 Terms and definitions

3.1

electric vehicle

EV

electric road vehicle

vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle, such as residential or public electric service), which is manufactured primarily for use on public streets, roads or highways

[SOURCE: ISO 17409:2015, 3.19, modified — Some precisions have been added.]

3.2

battery swap system

battery swap station and supporting systems

¹ Under consideration.